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8. LIFETIME

The length of an individual's life is an important factor to consider when evaluating cancer risk because the dose estimate is averaged over an individual's lifetime. Since the averaging time is found in the denominator of the dose equation, a shorter lifetime would result in a higher potential risk estimate, and conversely, a longer life expectancy would produce a lower potential risk estimate.

8.1. KEY STUDY ON LIFETIME

Statistical data on life expectancy are published annually by the U.S. Department of Commerce in the publication: "Statistical Abstract of the United States." The latest year for which statistics are available is 1993. Available data on life expectancies for various subpopulations born in the years 1970 to 1993 are presented in Table 8-1. Data for 1993 show that the life expectancy for an average person born in the United States in 1993 is 75.5 years (U.S. Bureau of the Census, 1995). The table shows that the overall life expectancy has averaged approximately 75 years since 1982. The average life expectancy for males in 1993 was 72.1 years, and 78.9 years for females. The data consistently show an approximate 7 years difference in life expectancy for males and females from 1970 to present. Table 8-1 also indicates that life expectancy for white males (73.0 years) is consistently longer than for Black males (64.7 years). Additionally, it indicates that life expectancy for White females (79.5 years) is longer than for Black females (73.7), a difference of almost 6 years. Table 8-2 presents data for expectation of life for persons who were at a specific age in year 1990. These data are available by age, gender, and race and may be useful for deriving exposure estimates based on the age of a specific subpopulation. The data show that expectation of life is longer for females and for Whites.

8.2. RECOMMENDATIONS

Current data suggest that 75 years would be an appropriate value to reflect the average life expectancy of the general population and is the recommended value. If gender is a factor considered in the assessment, note that the average life expectancy value for females is higher than for males. It is recommended that the assessor use the appropriate value of 72.1 years for males or 78.9 years for females. If race is a consideration in assessing exposure for male individuals, note that the life expectancy is about 8 years longer for Whites than for Blacks. It is recommended that the assessor use the values of 73 years and 64.7 years for White males and Black males, respectively. Table 8-3 presents the confidence rating for life expectancy recommendations.

This recommended value is different than the 70 years commonly assumed for the general population in EPA risk assessments. Assessors are encouraged to use values which most accurately reflect the exposed population. When using values other than 70 years, however, the assessors should consider if the dose estimate will be used to estimate risk by combining with a dose-response relationship which was derived assuming a lifetime of 70 years. If such an inconsistency exists, the assessor should adjust the dose-response relationship by multiplying by (lifetime/70). The Integrated Risk Information System (IRIS) does not use a 70 year lifetime assumption in the derivation of RfCs and RfDs, but does make this assumption in the derivation of some cancer slope factors or unit risks.

8.3. REFERENCES FOR CHAPTER 8

U.S. Bureau of the Census. (1995) Statistical abstracts of the United States.

Table 8-1. Expectation of Life at Birth, 1970 to 1993, and Projections, 1995 to 2010 (years)[a]

YEAR		TOTAL			WHITE			BLACK AND OTHER[b]			BLACK		
		Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
1970		70.8	67.1	74.7	71.7	68.0	75.6	65.3	61.3	69.4	64.1	60.0	68.3
1975		72.6	68.8	76.6	73.4	69.5	77.3	68.0	63.7	72.4	66.8	62.4	71.3
1980		73.7	70.0	77.4	74.4	70.7	78.1	69.5	65.3	73.6	68.1	63.8	72.5
1981		74.1	70.4	77.8	74.8	71.1	78.4	70.3	66.2	74.4	68.9	64.5	73.2
1982		74.5	70.8	78.1	75.1	71.5	78.7	70.9	66.8	74.9	69.4	65.1	73.6
1983		74.6	71.0	78.1	75.2	71.6	78.7	70.9	67.0	74.7	69.4	65.2	73.5
1984		74.7	71.1	78.2	75.3	71.8	78.7	71.1	67.2	74.9	69.5	65.3	73.6
1985		74.7	71.1	78.2	75.3	71.8	78.7	71.0	67.0	74.8	69.3	65.0	73.4
1986		74.7	71.2	78.2	75.4	71.9	78.8	70.9	66.8	74.9	69.1	64.8	73.4
1987		74.9	71.4	78.3	75.6	72.1	78.9	71.0	66.9	75.0	69.1	64.7	73.4
1988		74.9	71.4	78.3	75.6	72.2	78.9	70.8	66.7	74.8	68.9	64.4	73.2
1989		75.1	71.7	78.5	75.9	72.5	79.2	70.9	66.7	74.9	68.8	64.3	73.3
1990		75.4	71.8	78.8	76.1	72.7	79.4	71.2	67.0	75.2	69.1	64.5	73.6
1991		75.5	71.0	78.9	76.3	72.9	79.6	71.5	67.3	75.5	69.3	64.6	73.8
1992		75.8	72.3	79.1	76.5	73.2	79.8	71.8	67.7	75.7	69.6	65.0	73.9
1993		75.5	72.1	78.9	76.3	73.0	79.5	71.5	67.4	75.5	69.3	64.7	73.7
Projections[c]	1995	76.3	72.8	79.7	77.0	73.7	80.3	72.5	68.2	76.8	70.3	65.8	74.8
	2000	76.7	73.2	80.2	77.6	74.3	80.9	72.9	68.3	77.5	70.2	65.3	75.1
	2005	77.3	73.8	80.7	78.2	74.9	81.4	73.6	69.1	78.1	70.7	65.9	75.5
	2010	77.9	74.5	81.3	78.8	75.6	81.0	74.3	69.9	78.7	71.3	66.5	76.0

[a] Excludes deaths of nonresidents of the United States.
[b] Racial descriptions were not provided in the data source.
[c] Based on middle mortality assumptions; for details, see U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 1104.

Source: Bureau of the Census, 1995.

Table 8-2. Expectation of Life by Race, Sex, and Age: 1992

Age in 1990 (years)	Expectation of Life in Years				
		White		Black	
	Total	Male	Female	Male	Female
At birth	75.8	73.2	79.8	65.0	73.9
1	75.4	72.8	79.3	65.2	74.1
2	74.5	71.8	78.3	64.3	73.1
3	73.5	70.9	77.3	63.4	72.2
4	72.5	69.9	76.3	62.4	71.2
5	71.6	68.9	75.4	61.4	70.3
6	70.6	67.9	74.4	60.5	69.3
7	69.6	66.9	73.4	59.5	68.3
8	68.6	65.9	72.4	58.5	67.3
9	67.6	65.0	71.4	57.5	66.3
10	66.6	64.0	70.4	56.5	65.4
11	65.6	63.0	69.4	55.5	64.4
12	64.6	62.0	68.4	54.6	63.4
13	63.7	61.0	67.4	53.6	62.4
14	62.7	60.0	66.5	52.6	61.4
15	61.7	59.1	65.5	51.7	60.4
16	60.7	58.1	64.5	50.7	59.5
17	59.8	57.2	63.5	49.8	58.5
18	58.8	56.2	62.5	48.9	57.5
19	57.9	55.3	61.6	48.1	56.6
20	56.9	54.3	60.6	47.2	55.6
21	56.0	53.4	59.6	46.3	54.6
22	55.1	52.5	58.7	45.5	53.7
23	54.1	51.6	57.7	44.6	52.7
24	53.2	50.6	56.7	43.8	51.8
25	52.2	49.7	55.7	42.9	50.8
26	51.3	48.8	54.8	42.1	49.9
27	50.4	47.8	53.8	41.2	48.9
28	49.4	46.9	52.8	40.4	48.0
29	48.5	46.0	51.8	39.5	47.1
30	47.5	45.1	50.9	38.7	46.1
31	46.6	44.1	49.9	37.8	45.2
32	45.7	43.2	48.9	37.0	44.3
33	44.7	42.3	48.0	36.2	43.4
34	43.8	41.4	47.0	35.3	42.4
35	42.9	40.5	46.0	34.5	41.5
36	42.0	39.6	45.1	33.7	40.6
37	41.0	38.7	44.1	32.9	39.7
38	40.1	37.8	43.2	32.1	38.8
39	39.2	36.9	42.2	31.3	37.9
40	38.3	36.0	41.2	30.5	37.1
41	37.4	35.1	40.3	29.7	36.2
42	36.5	34.2	39.3	28.9	35.3
43	35.6	33.3	38.4	28.2	34.4
44	34.7	32.4	37.5	27.4	33.6
45	33.8	31.5	36.5	26.7	32.7
46	32.9	30.6	35.6	25.9	31.9
47	32.0	29.7	34.7	25.2	31.0
48	31.1	28.8	33.7	24.4	30.2
49	30.2	28.0	32.8	23.7	29.3

Table 8-2. Expectation of Life by Race, Sex, and Age: 1992 (continued)

Age in 1990 (years)	Expectation of Life in Years				
		White		Black	
	Total	Male	Female	Male	Female
50	29.3	27.1	31.9	23.0	28.5
51	28.5	26.3	31.0	22.3	27.7
52	27.6	25.4	30.1	21.5	26.8
53	26.8	24.6	29.2	20.8	26.0
54	25.9	23.7	28.3	20.1	25.3
55	25.1	22.9	27.5	19.5	24.5
56	24.3	22.1	26.6	18.8	23.7
57	23.5	21.3	25.7	18.2	23.0
58	22.7	20.6	24.9	17.6	22.2
59	21.9	19.8	24.1	16.9	21.5
60	21.1	19.1	23.2	16.3	20.8
61	20.4	18.3	22.4	15.8	20.1
62	19.7	17.6	21.6	15.2	19.4
63	18.9	16.9	20.8	14.6	18.7
64	18.2	16.2	20.0	14.1	18.0
65	17.5	15.5	19.3	13.5	17.4
70	14.2	12.4	15.6	11.0	14.3
75	11.2	9.6	12.2	8.9	11.4
80	8.5	7.2	9.2	6.8	8.6
85 and over	6.2	5.3	6.6	5.1	6.3

Source: U.S. Bureau of Census, 1995.

Table 8-3. Confidence in Lifetime Expectancy Recommendations

Considerations	Rationale	Rating
Study Elements		
• Level of peer review	Data are published and have received extensive peer review.	High
• Accessibility	The study was widely available to the public (Census data).	High
• Reproducibility	Results can be reproduced by analyzing Census data.	High
• Focus on factor of interest	Statistical data on life expectancy were published in this study.	High
• Data pertinent to US	The study focused on the U.S. population.	High
• Primary data	Primary data were analyzed.	High
• Currency	The study was published in 1995 and discusses life expectancy trends from 1970 to 1993. The study has also made projections for 1995 until the year 2010.	High
• Adequacy of data collection period	The data analyzed were collected over a period of years.	High
• Validity of approach	Census data is collected and analyzed over a period of years.	High
• Study size	This study was based on U.S. Census data, thus the population study size is expected to be greater than 100.	High
• Representativeness of the population	The data are representative of the U.S. population.	High
• Characterization of variability	Data were averaged by gender and race but only for Blacks and Whites; no other nationalities were represented within the section.	Medium
• Lack of bias in study design (High rating is desirable)	There are no apparent biases.	High
• Measurement error	Measurement error may be attributed to portions of the population that avoid or provide misleading information on census surveys.	Medium
Other Elements		
• Number of studies	Data presented in the section are from the U.S. Bureau of the Census publication.	Low
• Agreement between researchers	Recommendation was based on only one study, but it is widely accepted.	High
Overall Rating		**HIGH**